

What is claimed is:

1. A method of fabricating a semiconductor device comprising:

forming a capacitor comprising a lower electrode formed on a semiconductor substrate, a capacitive insulator made up of a metal oxide film, formed on the lower electrode, and an upper electrode formed on the capacitive insulator;

forming a metal pattern to be electrically connected to the electrodes of the capacitor;

forming a first protection film which coats at least a side face of the metal pattern; and

forming a water constituents diffusion preventive film on the side face and top face of the metal pattern through the intermediary of the first protection film.

2. A method of fabricating a semiconductor device according to Claim 1, wherein the first protection film prevents diffusion of water constituents, and oxidation of the metal pattern.

3. A method of fabricating a semiconductor device according to Claim 1, wherein the first protection film is made up of a highly insulating and passivated metal oxide film.

4. A method of fabricating a semiconductor device according to Claim 1, wherein the first protection film is formed by use of the chemical vapor deposition method.

5. A method of fabricating a semiconductor device according to Claim 1, further comprising etching the first protection film, and forming a sidewall of the first protection film on the side face of the metal pattern, thereby forming the water constituents diffusion preventive film on the
5 sidewall and the metal pattern.

6. A method of fabricating a semiconductor device according to Claim 5, wherein the metal pattern comprises a conductive layer to be electrically connected to the capacitor and a protective layer which protects the top face of the conductive layer, and the protective layer is exposed out of the
10 first protection film by etching the first protection film,.

7. A method of fabricating a semiconductor device according to Claim 5, wherein, in etching the first protection film, a tapered face is formed on the side face of the first protection film, and an angle formed between the tapered face and the top face of the conductive layer is not greater than
15 about 70°.

8. A method of fabricating a semiconductor device according to Claim 1, wherein the water constituents diffusion preventive film is formed by a reactive sputtering method.

9. A method of fabricating a semiconductor device according to Claim 20 8, wherein the reactive sputtering method is executed in a mixed gas atmosphere containing nitrogen and a rare gas, or nitrogen, oxygen and a rare gas.

10. A method of fabricating a semiconductor device according to Claim 1, further comprising forming a hydrogen diffusion preventive film on top of the metal pattern.

11. A method of fabricating a semiconductor device comprising:

5 forming a capacitor comprising a lower electrode formed on a semiconductor substrate, a capacitive insulator made up of a metal oxide film, formed on the lower electrode, and an upper electrode formed on the capacitive insulator;

10 forming an interlayer insulator on top of the capacitor and the semiconductor substrate;

forming a hole in the interlayer insulator for exposing a top face of the electrodes of the capacitor;

forming a metal pattern inside the hole for electrical connection with the electrodes of the capacitor;

15 forming an insulating film having a low water constituent content on the metal pattern inside the hole; and

forming a water constituents diffusion preventive film on the metal pattern or the insulating film having the low water constituent content.

20 12. A method of fabricating a semiconductor device according to Claim 11, wherein the sum of a thickness of the metal pattern inside the hole and a thickness of the insulation film having the low content of water constituents, inside the hole, as measured from the bottom face of the hole,

is substantially equivalent to not less than a thickness of the interlayer insulator.

13. A method of fabricating a semiconductor device according to Claim 11, wherein, in forming the insulation film having the low water constituent content, a chemical vapor deposition method using a gas containing an
5 organic silicon compound is employed.

14. A method of fabricating a semiconductor device according to Claim 11, wherein the insulation film having the low water constituent content has a thickness substantially equivalent to not less than half of the inside
10 diameter of the hole.

15. A method of fabricating a semiconductor device according to Claim 11, further comprising forming a first protection film on the metal pattern provided inside the hole, thereby forming the insulation film having the low water constituent content on the first protection film.

15 16. A method of fabricating a semiconductor device according to Claim 15, further comprising etching the first protection film, and forming a sidewall of the first protection film on the side face of the metal pattern, thereby forming the water constituents diffusion preventive film on the sidewall and the metal pattern.

20 17. A method of fabricating a semiconductor device according to Claim 16, wherein the metal pattern comprises a conductive layer for electrical connection with the capacitor, and a protective layer for protecting a top

face of the conductive layer, and the protective layer is exposed out of the first protection film by etching the first protective film.

18. A method of fabricating a semiconductor device according to Claim 17, wherein, in etching the first protection film, a tapered face is formed on the side face of the first protection film, and an angle formed between the tapered face and the top face of the conductive layer is not greater than about 70°.

19. A method of fabricating a semiconductor device according to Claim 11, wherein the water constituents diffusion preventive film is formed a reactive sputtering method.

20. A method of fabricating a semiconductor device according to Claim 19, wherein the reactive sputtering method is executed in a mixed gas atmosphere containing nitrogen and a rare gas, or nitrogen, oxygen and a rare gas.

21. A method of fabricating a semiconductor device according to Claim 11, further comprising forming a hydrogen diffusion preventive film on the metal pattern.